

AMENDMENTS

In the Claims

Please add new claims 56-83 as follows:

--56. An electrochemical cell, comprising a lithium electrode and a sulfur electrode including at least one of elemental sulfur, lithium sulfide, and a lithium polysulfide, said lithium electrode having a lithium metal electrode surface including a surface coating that is effective to increase the cycling efficiency of said electrochemical cell.

57. The electrochemical cell of claim 56, wherein said lithium electrode is in an electrolyte solution.

58. The electrochemical cell of claim 57, wherein said electrolyte solution contains at least one of elemental sulfur, a sulfide, and a polysulfide.

59. The electrochemical cell of claim 58, wherein said surface coating of said lithium electrode is formed prior to contacting said lithium electrode with said electrolyte.

60. An electrochemical cell, comprising a lithium electrode and an organo-sulfur electrode including an organo-sulfur material as a cathode active material, said lithium electrode having a lithium metal electrode surface including a surface coating that is effective to increase the cycling efficiency of said electrochemical cell.

61. The electrochemical cell of claim 60, wherein said organo-sulfur material includes at least one of an organic disulfide and a poly(carbon disulfide).

62. The electrochemical cell of claim 60, wherein said organo-sulfur material is a polymer including at least one of a polymer having the formula $(CS_x)_n$ where x is from 1.2 to 2.3 and n is greater or equal to 2 and a one-dimensional electron conducting polymer complexed with at least one polysulfurated chain, said polysulfurated chain having no covalent bonds with said conducting polymer.

63. The electrochemical cell of claim 60, wherein said lithium electrode is in an electrolyte solution.

64. The electrochemical cell of claim 63, wherein said electrolyte solution contains at least one of elemental sulfur, a sulfide, and a polysulfide.

65. The electrochemical cell of claim 64, wherein said surface coating of said lithium electrode is formed prior to contacting said lithium electrode with said electrolyte.

66. A battery cell comprising:

a. a positive electrode comprising a mixture of

- i. an electrochemically active material, and
- ii. an electronically conductive material,

b. a negative electrode comprising a lithium metal electrode surface including a surface coating that is effective to increase the cycling efficiency of said electrochemical cell; and

c. an electrolyte electronically separating the positive and negative electrodes;

wherein said electrochemically active material includes at least one component selected from the group consisting of elemental sulfur, sulfides of lithium, polysulfides of lithium, and combinations thereof.

67. A battery cell comprising:

a. a positive electrode comprising a mixture of

- i. an electrochemically active material, and
- ii. an electronically conductive material,

b. a negative electrode comprising a lithium metal electrode surface including a surface coating that is effective to increase the cycling efficiency of said electrochemical cell; and

c. an electrolyte electronically separating the positive and negative electrodes; wherein said electrochemically active material includes an organo-sulfur compound comprising at least one component selected from the group consisting of elemental sulfur, sulfides of lithium, polysulfides of lithium, and combinations thereof.

68. The battery cell of claim 67, wherein said organo-sulfur material includes at least one of an organic disulfide and a poly(carbon disulfide).

69. The battery cell of claim 67, wherein said organo-sulfur material is a polymer including at least one of a polymer having the formula $(CS_x)_n$ where x is from 1.2 to 2.3 and n is greater or equal to 2 and a one-dimensional electron conducting polymer complexed with at least one polysulfurated chain, said polysulfurated chain having no covalent bonds with said conducting polymer.

70. A battery cell comprising:

- a) a positive electrode comprising a mixture of
 - i) an electrochemically active material, and
 - ii) an electronically conductive material,

the mixture having between about 10% and about 100% of the electrochemically active material accessible to electrons and ionic charge carriers;

- b) a current collector electrically connected to the positive electrode;

- c) a negative electrode including

- i) a metal or a metal ion, and

ii) a protective layer on an electrolyte facing surface of the negative electrode; and

- d) an electrolyte separator;

wherein electrochemically active material is selected from the group consisting of elemental sulfur, sulfides of the metal, polysulfides of the metal, and combinations thereof.

71. The battery cell of claim 70, wherein the alkali metal comprises at least one of lithium, sodium, alloys of lithium, and alloys of sodium.

72. The battery cell of claim 70, wherein the protective layer has a thickness of between 100 angstroms and 100000 angstroms.

73. The battery cell of claim 70, wherein the protective layer has a thickness of between 1000 angstroms and 50000 angstroms.

74. The battery cell of claim 70, wherein the electrolyte separator is a liquid electrolyte separator.

75. The battery cell of claim 70, wherein at least about 20% of the electrochemically active material is accessible to electrons and ionic charge carriers.

76. The battery cell of claim 70, wherein at least about 40% of the electrochemically active material is accessible to electrons and ionic charge carriers.

77. A battery cell comprising:

a) a cathode comprising a mixture of

i) a cathode active material, and

ii) an electronically conductive material,

said mixture having a specific capacity of said cathode active material of between 300 mAh/g and 1400 mAh/g;

b) a current collector electrically connected to said cathode;

c) an anode comprising

i) lithium, and

ii) a protective layer on an electrolyte facing surface of said anode; and

d) an electrolyte comprising a separator;

wherein said cathode is selected from the group consisting of elemental sulfur, sulfides of the metal, polysulfides of the metal, and combinations thereof.

78. The battery cell of claim 77, wherein said anode is selected from the group consisting of lithium metal, lithium-tin alloys, lithium-aluminum alloys, lithium-silicon alloys, lithium intercalated carbons, and lithium intercalated graphites.

79. The battery cell of claim 77, wherein the protective layer has a thickness of between 100 angstroms and 100000 angstroms.

80. The battery cell of claim 77, wherein the protective layer has a thickness of between 1000 angstroms and 50000 angstroms.

81. The battery cell of claim 77, wherein said electrolyte is a liquid electrolyte.

82. The battery cell of claim 77, wherein said specific capacity of said cathode active material is at least 600 mAh/g.

83. The battery cell of claim 77, wherein said specific capacity of said cathode active material is at least 700 mAh/g.--

02/26/2014 10:59:26 AM